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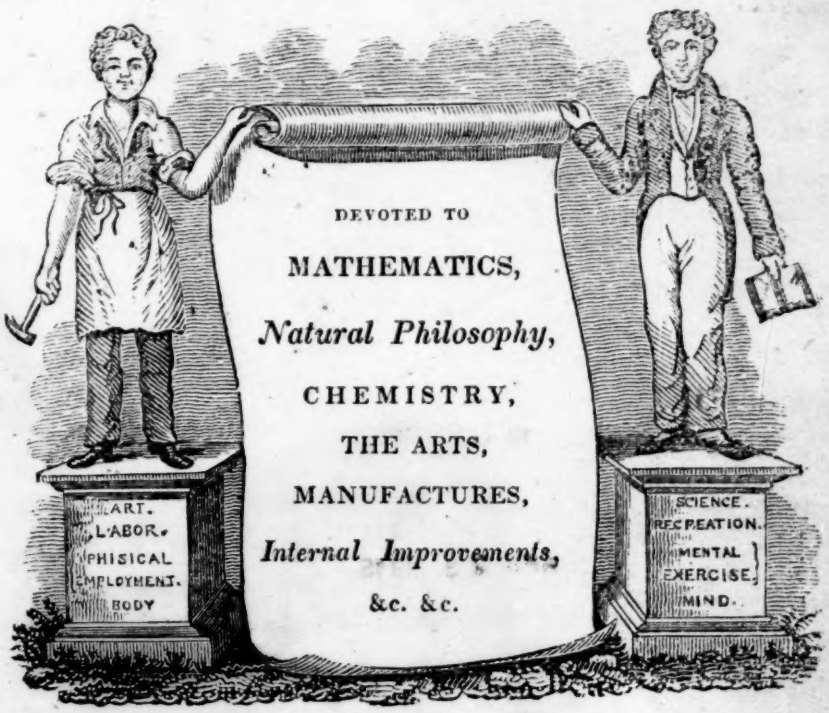
THE YOUNG MECHANIC.

CONDUCTED BY

AN ASSOCIATION OF PRACTICAL MECHANICS.



If those who are occupied in the proper business concerns of life, and its severest toils, had really no time for study, then would the great mass of society be doomed to perpetual mental degradation; but every man can spare at least one hour in the twenty four to the improvement of his mind; and one hour a day is about equal to four entire years in every twenty; which, so far as time is concerned, is sufficient to complete as extensive and varied course of study as can be pursued, from entering to leaving college.—*Freedom of the Mind.*

VOLUME I.

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PREFACE.

THE Conductors of the Young Mechanic, although they have had to encounter many difficulties, have the satisfaction of seeing one year of their labors completed. Their plan was to some extent an experiment. Having observed—and with no small degree of regret—the ill success of several similar works in this vicinity, they thought it inexpedient to attempt the establishment of a very large, or in any respect a very expensive magazine. But they were fully persuaded, that, by adopting in this case the principle upon which all undertakings should be commenced—viz. to begin according to one's own means and the prospects before him—they might be able to effect the object which their predecessors in this part of New England had failed to accomplish. This principle was acted upon ; and their expectations have been met. They looked particularly to the younger portion of our mechanics for their countenance and co-operation in the plan ; and they have not been disappointed. They are glad to say, that, so far as they are acquainted, the work has been approved of, and, what is more to the point, well patronised, wherever it has been introduced. The editors of some of the best publications of the day have also shown a warm interest in its success.

Of the faults of the present volume the Conductors are deeply sensible. But they have gained experience, and their resources

are multiplied ; and they believe that, knowing now better than before the wants of the class to whom their labors are devoted, they will hereafter be better able to supply them. *Their* motto, and they believe the motto of all who are engaged with them, is, 'IMPROVEMENT.' It will be one of their prominent objects to give the coming volume a more familiar, as well as instructive character. They ask indulgence for what has been amiss in the execution of their design thus far, trusting that, by the continuance of the support which has been received, they will be able, in the next volume, better to satisfy themselves, and answer the expectations of their subscribers.

Boston, December, 1832.

THE

YOUNG MECHANIC.

VOL. I. JANUARY, 1832. No. I.

TO YOUNG MECHANICS.

THE purposes proposed in the establishment of this Magazine are so well and so generally understood by most of those who are particularly interested in it, that it is not necessary to enlarge upon them. A brief summary, by way of recapitulation, and with the view of reminding our patrons—or pupils, as they may choose to be entitled—of what we hope to do for them and with them, is all that can now be expected of us.

The grand object is, to diffuse general elementary knowledge. There is no one of the arts practised among the subscribers to the YOUNG MECHANIC but is connected intimately with one or more of the sciences. 'All arts and sciences,' said a venerable philosopher of the ancient world, 'have a common bond of union.' Of two individuals engaged in the same department, be it what it may, the one who is most familiar with the *principles* of his business will always have an advantage over him who is expert only in the use of his tools. Farther than this, of two who are equally familiar with both the science and the art in question, he will have the advantage who has the most *general* information—the best disciplined mind—the firmest habits of mental industry, of vigilant observation of men and things, of persevering effort, of thorough inquiry, and of systematic and accurate reasoning. So much for mere success—emolument and reputation—in one's trade. We need not in this place undertake to show, that the character and influence of the well-informed man among and over his fellow citizens at large, will always be advanced in an equal proportion by those same efforts which go most immediately to promote his own interest. It need not be proved, that he will become just so far the better husband, father, citizen, the more fit for office

or honorable distinction of any kind, and the more likely to obtain them. Nor does any one require to be told, that the reputation of the whole body of mechanics, here and elsewhere—and with their reputation everything that depends upon it—must be founded upon the qualifications of the individuals who compose it.

As to the particulars of the plan upon which the YOUNG MECHANIC is to be conducted, we believe that they need not be set forth minutely at this time. Elementary information relating to any of the arts, will be gladly made use of whenever furnished in such quantities, and in such a style of plainness and clearness, as to be in our opinion calculated to benefit those for whom it is meant. Questions and queries will frequently occur at the Lyceum and other meetings, in conversation and in reading, which may be suggested and discussed in our columns to advantage. The Magazine may also be the medium of making known the new inventions which occur within the knowledge of our readers.

In fine, we put great confidence in the class of individuals for whose benefit our time and labor will be given, that they will work with us, and feel an interest in our success. And if *that* be the case, of success we cannot fail. The very effort to improve, always does improve. Labor is discipline and power. The inanimate magnet itself, is constituted by the laws of nature to have new strength added to it by every trial made upon what it already possesses.

NATURAL PHILOSOPHY.

WE have taken Webster's Philosophy from which to make some extracts on this subject. This work appears the most appropriate for our purpose, it being very concise and containing sound matter. It was edited some years ago by Prof. Patterson, and more recently by Amos Eaton of the Rensallear Schools. Chemical Affinity, Electric and Magnetic Attraction, have been omitted. These subjects will be treated on with the sciences to which they belong. Some of the more abstruse illustrations are also left out.

NATURAL PHILOSOPHY is that science which considers the powers of nature, the properties of natural bodies, and their action on each other.

ILLUSTRATION. Natural philosophy is distinguished from chemistry, by its treating on the laws of natural bodies in mass; whereas chemistry treats of the laws of the constituent atoms of bodies, as those atoms bear relation to each other.

THREE LAWS OF MOTION.

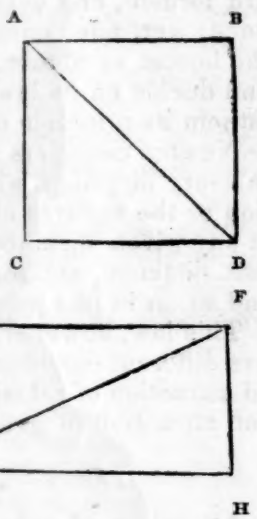
1. Every body continues in a state of rest, or moves uniformly in a right line, unless it be compelled to change that state by the

action of some external force. This law of matter is called *vis inertiae.*

ILLUSTRATION. Thus a ball discharged from a cannon would persevere in its motion forever, if it were not retarded by the resistance of the atmosphere and the operation of gravity. Or a top put in motion would have an endless revolution, if it were not impeded by the air and the friction produced by its point on the plane on which it moves. According to this law, the heavenly bodies also preserve their progressive motions undiminished in those regions which are void of all resistance.

2. The change of motion is always proportional to the moving force by which it is produced, and it is made in the line of direction in which that force is impressed.

ILLUSTRATION. By the first law, motion cannot be generated in a body, without some external impulse; and as the motion thus generated is directed in a right line with a velocity equal to the degree of impulse, the course of a body in motion can only be altered by a fresh impulse, and is then compounded of its own velocity and the impelling force; that is, the body will be either accelerated or retarded in a right-lined direction, in proportion to the compound force of the two impressions.



In the square A B C D, if a body be put in motion by an impelling force in the direction A B, and if at the same instant it be acted upon in an equal degree by another impulsion in the line A C, the body will be projected with a force and direction, compounded of the two impulses, which is represented by the diagonal line A D. In like manner if a ship at sea sail before the wind, in the line G H, due east, at the rate of eight miles an hour, and a current set from the north, in the direction G E, at the rate of four miles an hour; the vessel will be driven between the north and the east in the direction G F, compounded of the two acting forces, at the rate of nine miles an hour nearly.

3. Action and reaction are always equal and contrary. Or, the action of two bodies on each other is always equal, but in contrary directions.

ILLUSTRATION. Thus, if a stone is pressed by the hand, the reaction or compressive force on the hand, is equal to the pressure upon the stone. Or, when a horse draws a load, the power of the horse is diminished, or the animal is drawn back, with a force equal to that which puts the load in motion: for, if the weight of of the load be increased till it is equal to the strength of the horse,

it will remain at rest, although the whole force of the animal be in action. If a loadstone, and a piece of iron of equal weight, be suspended by strings near each other, the mutual force of attraction between them, will cause an equal action, and the two bodies will leave their respective positions with an equal impulse and velocity, and meet in a point equally distant from each.

If the bodies be unequal, they will meet in a point whose distance from the bodies will be reciprocally proportional to the difference of the powers.

If two floating vessels of equal magnitude be attached by a rope at some distance from eath other, a force applied to the rope in either vessel, will mutually draw them together, with an equal velocity, till they meet in a point equidistant from their first position.

ATTRACTION.

Attraction is the cause, power, or principle, by which all bodies mutually tend towards each other.

Illustration. This universal principle is considered as one of the first agents of nature in all her operations. By this extraordinary power, the minutest particles of matter cohere, bodies are formed, and even the whole universe is governed by its influence; yet, after endless opinions, its cause is still concealed in the bosom of nature. We clearly view the effects of attraction, and decide on its laws, but human ingenuity has not been able to fathom its principle or essence.

Newton considers it as a power or virtue proceeding from bodies in every direction, which decreases in energy or effect, in proportion as the squares of the distance from the body increase; that is, at any given distance, it will be four times as great as at twice that distance, and nine times as great as at thrice the distance; and so on in like proportion.

This law, however, only relates to one branch of attraction, as it has different modifications in its different divisions: these are called attraction of *cohesion*, *electrical* attraction, *magnetical* attraction, and attraction of *gravitation*.

ATTRACTION OF COHESION.

Attraction of cohesion is that force by which the particles of bodies mutually tend towards each other.

Illustration. It is the most powerful in the point of contact, or where the particles touch; at a little distance, it becomes considerably less; and when the particles are still farther removed, the effect is rendered insensible.

The power of corpuscular attraction, or the cohesion of particles of small bodies, may be shown by a variety of amusing experiments.

Take two leaden bullets, with a part cut away from each of their surfaces, so as to form a small plane, perfectly smooth and even.

This being done, press the flat surfaces together, twisting the bullets with the fingers as they are pressed; then the parts which touch each will adhere or be attracted with such force, as to require a power of more than fifty pounds weight to separate them.

The twisting of the planes of the bullets serves only to bring the parts nearer together; for, as it is scarcely possible to cut the surfaces perfectly even, this twisting pressure tends, from the softness of the metal, to rub down the inequalities, to expel the air which is contained between the planes, and to bring a greater number of parts into contact.

As the formation of bodies arises from the adhesion or attraction of the particles of matter; if the metal in the above experiment were perfectly free from porosity, and the planes mathematically even, on joining them together, the parts in adhesion would be as firm and inseparable as any other parts of the bodies.

But as corpuscular attraction extends only to infinitely small distances, and as a considerable part of the surfaces cannot come into contact, not only from the porosity of the metal, but from the inequalities of the planes; the elasticity of the air, which is contained in the interstices, is perpetually endeavoring to force them asunder.

The planes can only adhere when the power of the parts in contact is greater than the natural gravity, and the elastic power of the air contained between them; therefore the cohesive force is proportionable to the number of parts that touch each other.

If oil, tallow, or any other unctuous body, be smeared on the surface of the planes, in such a manner as to exclude a principal portion of the air which is contained between them, the planes will adhere with much greater firmness; so that plates of brass, silver or iron, of small dimensions, may be made to cohere with such force, as would require the united power of a number of men to pull them asunder. Experiment has shown, that plates not more than two inches in diameter, have taken a force of 950 lbs. weight to separate them, when the surfaces have been heated and smeared with boiling grease, and then left to cool before the power was applied. This adhesive power or quality in the particles of bodies, is not occasioned or aided by the gravitating weight of the atmosphere; for it is found by experiment, that it requires the same weight to separate them whether they be joined together in the open air or in vacuo.

By the attraction of adhesion the particles of a liquid arrange themselves in a spherical form.

Illustration. Rain, in falling from the clouds through the atmosphere, is formed into small spheres by the mutual attraction of the particles of water. The drops of rain which rest upon cabbage leaves, and other vegetables that are covered with a fine powder, also assume a spherical appearance from the same principle. Globules of quicksilver are formed in like manner, by the attraction of their parts, and incorporate by the same principle

when different globules come into contact. If a piece of board, or any other plane be laid on the surface of water, it will require a power six times as great as the weight of the body to take it up perpendicularly.

These, and many other facts which daily occur in the common occupations of life, serve to show the universal tendency of that corpuscular attraction which exists between small bodies; whilst the attraction of gravitation, extending to indefinite distances, causes all the regular changes and successions in the planetary system. Thus the Divine Being, by a different modification of the same incomprehensible principle, compounds and preserves the whole system of his works.

By that variety of the atttaction of adhesion, called capillary attractions, liquids ascend between the contiguous surfaces of bodies.

Illustration. Take two plates of glass ground even, and place them edgewise, very near to each other, in a vessel of water, first wetting the insides of the plates; then the attracting power of the glass will raise the water which is contained between them considerably above the general surface of the fluid. This height is proportional to the distance of the plates from each other. If they be placed about the hundredth part of an inch asunder, the water will rise more than an inch above the common surface in the vessel.

Capillary attraction is generally used to denote the ascent of fluids through small pipes or tubes, that compose a considerable part of the animal as well as vegetable body. If these tubes, which are as various in their number as they are different in capacity, by the energy of the living principle, nature conveys nutriment to supply the most distant branches of vegetation, where it could never arrive by the ordinary motion of fluids.

These tubes, as well as glass tubes, attract in an inverse proportion to their diameters, as the glass plates attract in proportion to their contiguity; that is, those tubes which are the smallest, raise the fluid to the greatest height, and the larger to a less height in a reciprocal proportion.

When the earth receives rain on its surface, the fluid is attracted through all the internal and contiguous parts; it is then absorbed by the roots of trees, plants, &c. and afterwards carried by capillary attraction to the most extended ramifications, through the multitudinous pores contained in the trunk and its branches.

Melted tallow and oil supply the flame of candles and lamps by the capillary attraction of the threads of the wick. Water poured round the bottom of a heap of sand, sugar, ashes, or any other porous substance, will diffuse itself till it has reached the summit. On this principle, perpetual springs are often supported on hills. This attracting power is likewise observable in lump sugar, sponge, linen, and many other bodies, when their lower extremities are dipped into water. In short, every porous or capillary substance is a conductor for the attracted fluid. This attracting power acts

independently of atmospheric pressure; for if capillary tubes be placed in a vessel of water under an exhausted receiver, the fluid will ascend to the same height as when the experiment is made in the open air.

CHEMISTRY.

We have made an extract from Dr. Hanaford's Lectures on Chemistry. The author has been at considerable trouble to condense his subject into a small volume. We only regret the absence of plates, to illustrate the more complicated apparatus. We differ a little from the Doctor, as to technical language; for no person can be master of any subject, if he is ignorant of the scientific phrases commonly used.

The object of Chemistry, it has been said, is to ascertain the nature and properties of all material things, not only in their simple state, but also in their infinitely varied combinations. Its range is extremely wide; there is no science, probably, under the head of which, are arranged such a vast number of unconnected facts, as in this. Although this is the case, still the *elementary* constituents of these almost innumerable substances, are not very numerous, being estimated only at about sixty in number.

A simple substance or elementary principle, in this science, means such as has never been decomposed, or reproduced by artificial means—of such, as has been stated, there are about sixty.

Simply for the purpose of more easily obtaining a knowledge of these, and their different compounds, they are generally, either in a description of their properties in books, or a notice of their properties by experiments, divided into classes.

The utility of classification in this, is about the same that it is under any other circumstances; i. e. by throwing together a certain number of facts or principles, in the same class, by becoming acquainted with the definition of such class, we gain a certain knowledge of all the principles placed in it, with the same ease that we should any particular one, without this classification.

Very different arrangements are made by different writers. In the one which we shall adopt they are divided into four classes, and in this classification we have reference to their sensible qualities.

In the first class are what are generally called the Chemical Powers, viz. Affinity, Caloric, Electricity, and Light. They are so called, because all chemical changes are wrought upon other substances, by the application of some one of them.

Affinity, which is merely a property of matter, is placed in this class because its effects are somewhat similar to the others in the same class; i. e. it produces chemical changes.

In the second class are such substances as have the property of supporting the common process of combustion, and rendering other substances *sour*. Hence called acidifying substances and supporters of combustion. The names, Oxygen, Chlorine, Fluorine and Iodine.

Without the presence of some one of these, it is supposed, we cannot have the common process of combustion or fire; neither can we have any substance, the taste of which is sour, in the composition of which some one of these do not form a part.

In the third class are such substances as have the property of undergoing combustion, and being rendered sour—changed into acids, by being united with some of the substances in ths last mentioned class—hence called acidifying and combustible substances, not metallic.

The names—Hydrogen, Nitrogen, Sulphur, Phosphorus, Carbon and Boron.

In the fourth class are the metallic substances, very numerous, in properties much unconnected with any of the substances in the three first classes, and as it requires much time to illustrate many of their properties, by experiment, and as a knowledge of them is of not so much use or interest to the generality of persons, but *little* notice will be taken of them in this short sketch.

AFFINITY.

Affinity, (sometimes called chemical attraction,) is that kind of attraction which unites the constituent atoms of compound substances. There are many kinds of attraction, but as we have but little to do with any except affinity in this science, it will be necessary to notice this only.

It is generally divided according to its application, into two kinds, called simple affinity and elective affinity. Also some again divide it into single and double elective affinity. These terms will now be explained.

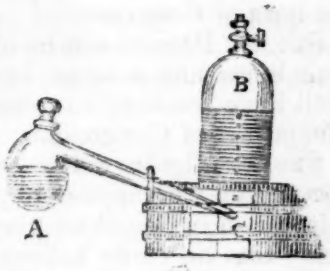
1. *Simple affinity* is that application of this kind of attraction, where two or more substances unite and form a new compound, without causing any decomposition.

Illustration. Mix oil, water and potash, or oil and liquid ammonia, and they will immediately unite and form a new compound differing from any of the constituents, and yet there will be nothing thrown off from a previous state of union.

2. *Elective affinity* is different; it is where two or more substances unite and form a new compound, to the exclusion of some other substance, from a previous state of union.

Illustration. Put into a retort, a small quantity of pearlash, chalk or marble. (The first of these is composed of *carbonic acid* and potash; the two last of the *same acid* and lime.) Turn into the retort a small quanity of sulphuric acid, diluted with *ten* times

its volume of water. There will be an immediate effervescence; carbonic acid will be given off in greater quantities, and may be collected as represented in the annexed figure. A is the retort, B the receiver, C the pneumatic trough with a shelf placed one inch below the top, and covered with water. The receiver being first filled with water, is placed on the shelf. The gas, as it is disengaged from the retort, passes through a hole in the shelf, and rises to the top of the receiver. Displacing the water, the gas may be transferred to a bladder attached to the stop cock by opening the cock and sinking the receiver in the water. The ground stopper at the top of the retort is to put in materials without displacing it.



EXPLANATION. The lime or potash has a stronger attraction for the sulphuric acid, which is an extremely strong acid, than it has for the carbonic acid, which is very weak; it *elects* it therefore,* unites with it, and forms the new compound, (sulphate of potash or lime,) to the exclusion of the carbonic acid, which was in a previous state of union.

3. When substances unite by this kind of attraction, i. e. affinity, their properties and sensible qualities are frequently very much changed.

ILLUSTRATION. Take a small quantity of muriatic acid in a glass, and put into it carbonate of soda as long as there is any effervescence. The result will be a solution of common table salt.

The muriatic acid is extremely sour and corrosive, so much so that it would take but a small quantity to destroy life, if taken into the stomach.

The soda also has energetic properties, in taste much like common pearlash; yet when they unite by this kind of attraction, the properties of both are changed, the acid loses all its acid properties, the alkali its peculiar properties, and this comparatively inert substance, common salt, is the result.

The salt is composed of muriatic acid and soda, (the proper name of it, *muriate* of soda,) and here these directly unite and form it.

From the Mirror of the Patent Office.

ANALYSIS OF THE LAW OF PATENTS.

SEC. 1. Patents, like all other monopolies at common law, are supposed to be against the policy of the state, and are founded on

* Hence the term, elective affinity.

statute. The rights of patentees therefore, depend entirely upon the laws of Congress.

Sec. 2. Patents can be obtained by none but native citizens, and their heirs and assigns, or aliens, who at the time of petitioning, shall have resided two years in the United States; unless it be by special act of Congress.

Sec. 3. The invention or discovery must be *new*. It must be *new* to him who applies for the patent. As, if he is conscious that it is not so, it would be perjury to take the oath required by law, viz: 'that he verily believes he is the true discoverer, or inventor of his said improvement.'

It must be *new* in fact. For if another person has made the discovery before; he, and not the one making the application, has the right to the patent, although he never has applied for it.

Sec. 4. It may be *new*, either in *principle*, or in the *method* of producing a good effect.

Sec. 5. It must not only be new, but *useful*. For if it be the discovery of an abstract principle merely; or of any thing resting in theory and speculation, and not connected with any useful purpose, it cannot be patented.

But the discovery of a *new employment* of principles already known, and in use, for new and useful purposes, entitles the inventor to a patent. So that improvements upon, or additions to, old arts, may be patented. But in such case, it is the improvement, or addition only, that can be patented. And such a patent gives no exclusive right to use the thing to which such addition or improvement is made.

Sec. 6. The form of the machine, for which the patent is claimed, is not material, if so be that it is well calculated to produce the designed effect, and the specification is such, that it can be used, and understood by a jury. Therefore, changing the form, or mode of constructing a machine, or instrument, to produce the same effect, is not the subject of a patent.

Sec. 7. Every invention or discovery, for which a patent is claimed, must be calculated, either to produce a *new* and *useful effect;* or to produce the *same effect*, which has been produced by others, in a *new* and *essentially better method*, than any other person has discovered.

Sec. 8. Patents may be assigned, and the assignment being recorded in the office of the Secretary of State, the assignee shall thereafter stand in the place of the original inventor, in the first instance, or in place of the assignor, if it has been before assigned, as the case may be, both as to right and responsibility.

Sec. 9. In case of interfering applications for patents, the law has expressly provided, that the right of granting the patent shall be decided by three arbitrators, one to be chosen by each party, and the third by the Secretary of State; and their award, or that of any two of them, shall be final, as respects the right of granting the patent.

SEC. 10. Patents void, or voidable, howsoever obtained, may be set aside by the District Court where the patentee, his executors, administrators, or assigns reside—by process in the nature of a quo warranto.

SEC. 11. Any person making, devising, using, or selling the invention of a patentee, without his or her consent; or that of his heirs, executors, or administrators, expressed in writing, shall forfeit a sum equal to three times the amount of the actual damage sustained by such patentee.

SEC. 12. In order to obtain a patent, the inventor must present a petition to the Secretary of State, who will, if the application appears to him to be well founded, cause letters patent to be made out, and submitted to the Attorney General, who shall certify and return them, if he finds the applicant is entitled to a patent. After which the patent is made out in due form, and given to the applicant, he having paid thirty dollars into the Treasury of the United States for the same.

SEC. 13. The application must be accompanied with a specification of the invention, whatsoever it may be, in all cases, and also with a suitable drawing and a model, if required: showing the manner of making, compounding, applying and using the said invention, in such a fair and express manner and form as to distinguish it from all others; and enable any person skilled in the art or science to which it belongs, or with which it is connected, to form and use the same.

MESSRS. EDITORS—Being a young mechanic, and somewhat desirous of obtaining a knowledge of facts and precepts relating, not only to my own daily vocation, but to the arts and sciences in general; and believing that one of the most effectual means of obtaining this object is, to make known willingly, to examine candidly, and discuss freely with my brother mechanics, our principles and our practices, I send you the following observations upon a practical topic, which you may insert in the pages of the first number of your Magazine if you think they are deserving a place.

LEAKY ROOFS.

LEAKY chimneys and battlements are no insignificant evils. It is too frequently the case that within three or four years after a building is finished, the storms begin to find their way into the interior, to the no small damage of the plastering and inconvenience of the occupant. This is an evil which might have been prevented, and one which can easily be remedied.

The cause of it is, the imperfect manner of fastening the lead

into the brick joints. Both slaters and masons in this city, generally use wooden wedges for fastening the lead, and fill the space in the joints not occupied by the wedges with loose mortar. In a short time the wedges will have decayed and the mortar entirely washed away, and there is nothing left to prevent the storm from driving under the lead, and thence through the roof.

If the following method of leading chimneys and battlements be observed, they will remain tight (extraordinary causes excepted) as long as the building will stand. The lead should enter the joint about one inch and a quarter; and the part thus entered should then be flattened closely down to the brick upon which it rests. The joint should then be filled with stiff mortar, which should be driven home to the back part of the joint with a piece of thin iron or hard wood; there will then be room in the joint for a second quantity of mortar, which should be driven home to the first; and this process should be repeated until the joint is perfectly full and solid.

Battlements and chimneys leaded in this manner will add credit to the mechanic, profit to the owner, and comfort to the occupant.

H.

SOCIETY FOR THE ENCOURAGEMENT OF MECHANICAL GENIUS.

'The products of a man's mind are as much his property as those of his hands.'

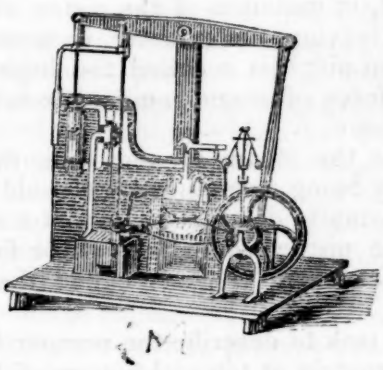
If this be true, ought not something to be done to secure the credit to those who spend much time and thought in perfecting useful inventions? The patent office is not adequate to this. It has been stated that very few of the patents would stand if tried in a law-mill. There are so many points to be attended to—such as originality, the oldest patent, the claiming of too much or not enough, the not being sufficiently explicit, and not furnishing proper drawings or models, &c. that the expenses of a law-suit are so frightful a poor man dare not engage in it.

Several plans have been proposed to effect this object. One is, for a company, after examining the project, to raise the needful to carry the plan into execution; said company to become co-proprietors.

I will take the liberty to propose a plan. Suppose a society were formed in Boston, with a small fund—say one or two hundred dollars a year. Let this society hire a room, or what is still better, procure one at the expense of the state, for a place of general deposit of the articles of inventors. Let them invite inventors from all parts of the state to send their plans, models, &c. to this room for examination by suitable committees, appointed on

various subjects. But, instead of giving the successful inventor a sum of money, give him a certificate, which will cost but a trifle, and he will thereby obtain a good name, which is better than rubies. Let this be done in public, and nothing will have a greater tendency to encourage him in his vocation. Publish an account of all the inventions annually. Undoubtedly such a book would sell well; and the community would thereby know the meritorious inventor from those that pirated other men's inventions. In a word, it would have a tendency to establish a correct feeling in the community.

I would take the liberty of proposing this as a subject for the consideration of the State Lyceum. A FRIEND TO MECHANICS.



From the Education Reporter.

THE STEAM ENGINE.

THE name of the *Steam Engine*, to most persons, brings the idea of a machine of the most complex nature, and hence intelligible only to those who will devote much time to the study of it.

But he that can understand a common pump may understand a steam engine. It is in fact only a pump, in which the fluid is made to impel the piston, instead of being impelled by it; that is to say, the fluid acts as the power instead of being the resistance. It may be described simply as a strong barrel or cylinder, with a closely fitted piston in it, which is driven up and down by steam admitted alternately from above and below from a suitable boiler; while the end of the piston rod, at which the whole force may be considered to be concentrated, is connected in any convenient way with the work that is to be performed.

The power of the engine is of course proportioned to the size of the piston and the density of the steam; that is, if the area of the piston be equal to one hundred square inches, and the density of

the steam equal to twenty pounds on the square inch, then the whole force against the piston will be two thousand pounds. In some of the mines in Europe there are cylinders and pistons of more than ninety inches in diameter, on which the pressure of the steam equals the effort of six hundred horses. The mechanical properties of steam are precisely like those of common air; hence any person, who is familiar with experiments in pneumatics, will readily see how the elastic force of the steam is capable of moving the piston in the cylinder of a steam engine; and how, by attaching a lever or other contrivances to the piston rod, motion may be communicated to pumps, mills, &c.

Those who are not familiar with such experiments, may try for themselves the following:—Take a goose quill, and a slice of potato, press one end of the quill on the potato, and cut out a piece which will be left in the quill; this may be blown by the breath to a considerable distance, or it may be pushed backward and forward in the quill, in imitation of the piston of a steam engine. The steam, after leaving the cylinder, is sometimes allowed to escape into the open air; this is called the high pressure engine, on account of the force of steam required to act against the pressure of the atmosphere.

In other engines the steam escapes from the cylinder into a vessel, kept cool by being surrounded with cold water. Here the force of steam is instantly destroyed; so that a vacuum is kept up on one side of the piston, while the whole force of the steam presses on the other side. This is called the low pressure, or condensing engine.

It is not an easy task to describe the manner in which the steam is made to act alternately at top and bottom of the piston, without a diagram, nor even with one, unless some parts are moveable.

A real model of a steam engine, besides being very expensive, and many of the parts hidden from sight, is not easily managed by those whose business it is to teach. In consideration of the difficulties, a model (a figure of which is at the head of this article) has been contrived which is not very expensive, and easily managed. By this, a correct idea of the most essential parts of the steam engine may be easily obtained.

STOVES AND CHIMNEYS.

Messrs. Editors—As economy in fuel and the construction of chimneys, stoves, grates, &c. are of general importance to the community, particularly to mechanics, I send you a few remarks on the subject, believing they will be appropriate to your proposed Magazine. Wood, charcoal, bituminous and anthracite coal are

the combustions in most common use. Wood yields a cheerful blaze, and, like bituminous coal, is accompanied by smoke when the combustion is not complete. Anthracite coal and charcoal yield but little blaze and smoke, and are therefore better adapted for many purposes than any other combustible substance. The principle that governs the draught of chimneys is the expansion of the heated volume of air, whereby it becomes specifically lighter than common air, and has a tendency to ascend.

The great fault of all the open fireplaces or chimneys for burning wood and coal in common use is, that they are much too large, or rather it is the throat or lower part of its open canal, in the neighborhood of the mantle and immediately over the fire, which is too large; whereby a greater quantity of cold air is in the chimney than can be rarified by the fire on the hearth. The smoke is forced back into the room and the free combustion of the fuel is prevented. This is particularly the case where green wood is used for fuel. Were house-keepers generally aware of the loss attending the use of green wood for fuel, more care would be taken to procure seasoned wood—particularly for domestic economy. Mr. Bull of Philadelphia, found some sorts of green wood, 100 pounds of which contained 42 pounds of moisture. 2 1-2 pounds of wood are required to convert 6 pounds of water into steam. To convert the 42 pounds of water into steam required all the heat produced from the combustion of 17 1-2 pounds of wood. Deduct the 42 pounds of water, and the 17 1-2 pounds of wood required for evaporations, leaves only 40 1-2 pounds from which heat is obtained. To obviate the smoke of chimneys, stoves of various constructions have been introduced, not only to prevent the smoke, but having metallic pipes to transmit caloric more readily, and impart more heat from the combustion of all kinds of fuel than brick or stove flues. Where wood is used in stoves to which long pipes are attached, large fires of dry wood are necessary to prevent condensation of moisture within them. A portion of this moisture consists of pyraligneous acid—one of the most powerful acids for corroding metals. The anthracite coal yields no decaying acid or soot and but little ashes to coat the inside of the pipe. It will therefore appear that a sheet iron pipe connected with a stove in which anthracite coal is used will not only continue to yield heat more freely, but will last much longer than when wood is used for fuel. A great many stoves have been constructed for burning the anthracite coal. Messrs. Wilson & Co. of New York, have arranged their Pyramid and Franklin stoves with two series of sheet iron columns, the heat passing up those in front and down those in the rear. By this improvement, a large surface is exposed, through which the heat is transmitted. Dr. Nott of Schenectady has invented a stove for burning this coal, superior to any other now in use. Mr. Allen, in his work on the science of mechanics says, 'It is truly an elaborate production, constructed upon the most scientific principles applicable to the economical use of caloric. He has combined

science with taste in the arrangement of the parts of it. The lower portion, or pedestal, is formed of the best non-conductors of caloric to preserve the heat concentrated around the fuel, and to render the combustion perfect, while the external parts do not become heated so hot as to affect the air of a room unpleasantly. The upper portion presents to view the several pillars supporting an arch or canopy. The circulation of the draught of hot air through all the columns and other parts of the stove, exposes a surface equal to about forty feet of stove pipe, by means of which nearly the whole of the heat produced by the combustion of the fuel is imparted to the air of the room.'

Should this subject be acceptable, I shall make some remarks in your future numbers, on the heating of buildings with air and steam; and also upon using the anthracite coal for culinary purposes. W.

QUESTIONS.

At what distance from one end of a stick of timber 25 feet long should two men be placed with a hand spike, in order to support twice the weight that one man would at the extremity of the other end of the stick? P.

Messrs. Editors—I have seen advertised for sale, a farm in the State of Maine, connected with which is a pond or river, which never freezes, even in the coldest winters. Being a *young mechanic*, I should like to know the cause of this; and as the answer may benefit others as well as myself, I would ask some of your correspondents to favor me with a solution of this apparent mystery. U. M.

TO CORRESPONDENTS.

We have received an article on Mathematical Instruments used by Draftsmen and Mechanics, for which the author has our thanks; it will be published in a series of numbers. An article entitled, 'The Perpetual Motion a Perpetual Notion,' is received. A Question relating to scholars in schools, one respecting apprentices, and another about several horses being killed by lightning, will probably appear in our next number.

We would call the attention of correspondents to the Questions published in this number.